

SIR ISAAC NEWTON AND INDIA

K. V. Ramakrishna Rao

B.sc. M.A AM.I.E. C.En I. B.L.B

There were well-established schools or learning centres in eastern countries - India, Central Asian countries and Middle East. All Hindu, Buddhist monasteries and later Muslim madrasas functioned as Universities. But, according to European claims at the end of 12th century, there were only three prominent universities in Europe - Paris (Theology), Bologna (Law), and Salerno (Medicine). However, there were other Universities where many reputed scientists studied, where the Brahmagupta's Siddhanta and Indian tables reached already through Moors/Muslims. They were known as Zij, reportedly derived from Siddhanta, the Indian astroinomical work -Siddhanta -Sindhind -Zij. The Indian numerals were known as Ar ruqum al Hindiye. Alkhwazmi of Khiwa's work is known as Sindhind as saghir, (minor Sindhind or minor Siddhantas to distinguish from the major Siddhanta of Brahmagupta). Thus, there are hundreds of Zijis -Zij-I sultani of Uleg Beg, Zij-I Khaqani of Giliyath al-Din-Kashi and so on.

Under the patronage of Alphonso X (1226-84) of Castile, the famous fifty astronomers at Toledo improved and compiled astronomical tables in 1252. They are known

as Alphonso tables and first printed in 1483. The other places are - Padua (a town, capital of Padova, Italy), Toledo (a city near Madrid, Spain -University established in 1222 became famous in 13th century), Bologna, Oxford (c.1167?), Paris (c.1140 or 1170?) and Berlin were famous for researching on India with Indian manuscripts. As Buddhist (from China) and Muslim (from Middle East) scholars, came to India to collect manuscripts, scrolls, palm leaves and other documents on Arts and Sciences, the Christian missionaries (from Europe) followed the suit. The Indian works were translated into Arabic and then to Italian, as it was the language of the priests and scientists. From Italian, they were translated into European languages - Portuguese, French, German, English and so on reaching the European scientists.

European Research on Indian Astronomical Tables :

The Tiruvalore astronomical tables (of 1687) created a great storm among the astronomers, mathematicians and scientists¹. The tables start with an epoch during the conjunction of planets that occurred in 3102 BCE, which is, nothing but the starting of Kali age according to Hindu astronomers and



chronologers. The astronomical manuscripts mainly contain the following :

1. Tables and rules for calculating the places of the sun and moon.
2. Tables and rules for calculating places of the planets.
3. Rules by which the eclipses of planets are determined.

All astronomical calculations and Puranic-based computation of events had been according to Kali era in India duly recorded in astronomical works and inscriptions². As such computation went beyond Mosaic flood, the Christian scholars and scientists spent much time to ascertain the authenticity and accuracy of such reckoning. As more and more astronomers, mathematicians and scientists started accepting the authenticity of the era, another parallel group initiated counter arguments. Thus, Cassini, Baily, John Playfair, Colebrook and others supported it, while, Newton, Joseph Priestley, John Bentley and others opposed it all in the name of science. The marathon debate that occurred on the Kali era has not died down even today³.

With this background, the study of Newton is begun specifically dealing his connection with India. As astrology is characteristically related to India, Newton's interest in astrology, if any, is analyzed.

Newton and Indian astronomical Tables :

Much secrecy has been maintained about Newton's work dealing with astronomical tables, particularly '**Kepler's Tables**' and '**other Tables**', obtained from John Flamsteed, the first Astronomer Royal. Scholars assert that "**many of the lost letter**" written by Newton on this subject to John

Flamsteed, the supplier of Tables to him⁴. Newton records in one letter characteristically as follows, addressed to Flamsteed:

"Your information about the errors of Kepler's tables for Jupiter and Saturn has eased me of several scruples. I was apt to suspect there might be some cause or unknown to me which might disturb the sequential proportions, for the influences of the planets one upon the another seemed not great enough, though I imagined Jupiter's influence greater than your numbers determine it. It would add to my satisfaction if you would be pleased to let me know the long diameters of the orbits of Jupiter and Saturn, assigned by yourself and Mr Halley in your new tables that I may see how the sequential proportion fills the heavens, together with another small proportion which must be allowed for" (emphasis added).

This clearly proves that they were trying to construct A new tables based on the 'Kepler's tables' and as well as 'other tables'. Definitely, 'the other tables' must have been Indian, which were in circulation among the European astronomers, mathematicians and scientists during the material period.

In those days, the missionaries were the main suppliers of source materials to the scholars and scientists of the Europe. Newton had studied the astrological works of most of the ancient civilizations. But, he was surprised to note that the astrology of India was connected with the Zij-tables, which were nothing but astronomical tables. And these tables were derived, copied and constructed from the Siddhantic works of India as explained above. Thus, he developed special interest in



studying such astronomical tables of India. The more and more he studied the tables, his scientific mind could easily recognize that they were far more advanced than the ones, which the European astronomers and scientists were engaged to construct. Particularly, the connection of such tables starting with an epoch with 3102 BCE made him realize its importance.

Newton, John Wallis and Mathematical Studies :

Newton followed John wallis (1616-1703) in his scientific and mathematical pursuit. John Wallis had known the Indian mathematics and used the symbol ∞ to denote 'infinity' for the first time.⁵ Though, definitely, he obtained this from the Indian sources, he did not acknowledge it. Thus, Voltaire later remarked that **'the use of love-knot does not add to our understanding of the concept'**, because there was no concept of infinity and its conceptual development in Europe or elsewhere in any philosophical, mathematical or any other connected works. Newton claimed that he conceived the method of Infinite series after reading Wallis between 1664 and 1665 before the plague without elaborating how he got such an idea suddenly. It is also not mentioned as to whether he got it only from Wallis's works or also his collection of Indian treatises. In fact, Leibniz had also reportedly intended to write a book on 'infinities', but he never got around it.

PhilosophyTheology and Mathematics : It is well known fact that though philosophy was connected and studied with and for theology and its interpretations for the benefit of the Church and Bible, it had led to the scientific

thinking leading to the discovery and invention of new ideas in the respective fields. Many times, philosophers turned into mathematicians and vice versa. Particularly, in the Number system, concept and evolution of Zero and Infinity, theory of numbers etc., both groups overlapped and merged with each other. However, in India, such concepts had been there at least 1500 to 2000 years ahead of them as is evidenced from the recorded documents. John Wallis, who has been credited with the inventor of the ∞ symbol, has in fact simply adopted it from the Indian astronomical and mathematical manuscripts. William Jones⁶ has pointed out in a round about way in referring to Newton that-

the whole of his (Newton's) theology, and part of his philosophy, may be found in the Vedas, and even in the works of Sufis.

However, his linking of Sufis in this context exposes another new dimension of the fact that most of the earlier Sufis were Indians, later converted to Islam and roamed as Sufis-saints to escape from persecution for their eclectic, pantheistic, idolatrous views and pursuits⁷. During the Abbasid period, many Indian scholars of all fields, particularly, sciences, mathematics, astronomy, metallurgy, Medicine, surgery etc., were invited to translate Sanskrit works into Arabic, which were later translated into Italian and then into Portuguese, French, Latin, English languages facilitating the European scientists and scholars.

Newton's Study of Astronomy and Chronology :

His study of astrology and astronomy has already been pointed out. How, he used them



for chronology could be noted from his work **Chronology of Ancient Kingdoms Amended** (posthumously published in 1728), where he insisted that no civilization be earlier than the Jewish one. He did not accept any civilization's chronology that went beyond the Flood. Joseph Priestley *'invoked the authority of Newton as well as detailing Jone's determined efforts to reduce the enormous time of Hindu mythical history' to proper Mosaic proportions*.⁷ Thus, evidently, Newton rejected the Kali era starting with 3102 BCE after the study of Indian astronomical tables. He was a staunch believer and interested in the ancient astrology, mythology, cosmology, Church history, Biblical prophecies, etc. According to him, *'Ancient mythology was nothing but historical truth in a poetical dress*'. Because of his extreme views about Christianity, P. J. Marshal characteristically mentions him as **the more intrepid Christian**⁸. According to John Locke (1632-1704), Newton had few equals in Biblical knowledge.

He tried to bring new precision in chronological discussions by using astronomical calculations. He interpreted that Chiron the Centaur was said to have been the first to delineate the constellations and to help the Argonauts to make a sphere by which to navigate. Newton⁹ tried to date the Argonauts' expedition by comparing the equinoctial colure on Chiron's constellation with his own observations for 1689. He believed that the mention of the zodiac could be traced back to this event. He propounded that the practice of observing stars began in Egypt and Greeks derived from them. But, William Jones discounted his theory and he had gone to the

extent that Newton had been influenced by the Indian thought as already pointed out above.

Did Newton's Knowledge of Gravitation Derived from India? :

It is well known that the discovery of Gravitation by Newton is surprisingly associated with the observation of falling of an apple on the ground! Were apples not falling so before or differently? Definitely, not. Therefore, a critical study into his discovery reveals that something is covered up in his unearthing of Gravitation. Even his 'divine inspiration' to do so appears to be a facade to hide the facts behind. How he explained the phenomena scientifically? He said that *'Gravity must be caused by an agent acting constantly according to certain laws, but whether this be material or immaterial I have left it to the consideration of my readers*'. Why so much mystery around its discovery?

In fact, the other version is that he derived his knowledge of Gravitation from Jacob Boehme¹⁰ (1575-1624), a German Philosopher and mystic interested in the origin of world, alchemy and Indian philosophy. His earliest work, *Aurora* (1612) was denounced from the pulpit and the magistrates of Gorlitz forbade him to write any more. After his death, his works were translated, into English. His explanations of theological and cosmological concepts with 'obscure symbols' and 'natural images' have been obtained from 'unknown sources'.

The **Athenaeum** of January 26, 1867, had some curious information on the subject of origin of the theory of Gravitation:

'Positive evidence can be adduced that



Newton derived all his knowledge of Gravitation and its laws from Boehme, with whom Gravitation or Attraction is the first property of nature... For with him, his (Boehme's) system shows us the inside of things, while modern physical science is content with looking at the outside.'

In a passage of his Principia, Newton tells us plainly that, physically considered, attractions are rather impulses. In Section xi (Introduction), he expresses the opinion that 'there is subtle spirit by the force and action of which all movements of matter are determined' (Defin.8, Bk.I, Prop. 69, Scholium) and in his Third Letter, to Bentley he says:

"It is inconceivable that intimate matter should, without the mediation of some thing else which is not material, operate upon and affect other matter, without mutual contact, as it must if gravitation, in the sense of Epicurus, be essential and inherent in it... That gravity should be innate, inherent and essential to matter, so that one body may act upon another at a distance, through a vacuum, without the mediation of anything else by and through which their action may be conveyed from one to another, is to me so great an absurdity that I believe that no man, who has in philosophical matters a competent faculty of thinking, can ever fall into it. **Gravity must be caused by an agent acting constantly according to certain laws, but whether this agent be material or immaterial I have left it to the consideration of my readers**' (Vol.n, pp.213-214).

At this, even Newton's contemporaries got frightened - at the apparent return of Occult Causes into the domain of physics. Leibnitz

called his principle of attraction '**an incorporeal and inexplicable power**'. This supposition of an attractive faculty and perfect void was characterized by Bemouilli as 'revolting', the principle of *actio in distans* finding then no more favour than it does now. Euler, on the other hand, thought the action of gravity was due to either **a Spirit or some subtle medium**. (Vol. II. p.214).

Therefore, there is a strong reason to believe that Newton derived the concept of Gravitation, Gravitational force and connected ideas from Indian sources but without acknowledging. To suppress the facts, the British adopted the technique of deriving all modern scientific interpretations from 'Newton's Universal Law of Gravitation'. Thus, Herschel points out that Newton left for his successors the duty of drawing all the scientific conclusions from his discovery. How modern science has abused the privilege of building its newest theories upon the law of gravitation may be realized when one remembers how profoundly religious was that great man (Blavatsky, Secret Doctrine, Vol.II, p.219, fn.1).

The gravitational force and the force of attraction between the planets, the attraction of all planets towards the Sun and the rotation of them around the Sun in the specific orbits etc., have been clearly mentioned in the Vedic and Siddhantic works. In fact, Indian astronomers have already propounded a planetary model well before the European counterparts. The moment they get the Indian works, their doubts were immediately cleared and they started propounding theories. However, fearing that the Church might prosecute



them for using 'Satanic works', they concealed the sources and giving their own way of interpretation with Latin / Greek terminology, thus appearing as originating from the European / non-Indian sources.

Zodiac, Newton and India :

The study of planetary motion involves Zodiac and asterism with reference to earth. If at all any man on the earth could have observed and recorded any movement of Sun, Moon and other planets and asterism, he could have done it keeping earth as his plan of reference. When such references are clearly available in Vedas, it is quite intriguing to note as to why such important facts are denied, just because the Vedas are connected with Indians. So Newton believed that the invention of the Zodiac could be traced as far as back as the expedition of the Argonauts, thus giving credit to the Greeks. Argonauts, according to Greek mythology, are the sailors of the Argo, who voyaged to Aea (afterwards called Colchis) to win the Golden Fleece. He attempted to date the expedition by the observations on Chiron's sphere. Chiron the centre was said to have been the first to delineate the constellations and to have helped the Argonauts to make a sphere by which to navigate. Newton tried to date the Argonauts' expedition by comparing the equinoctial colure on Chiron's constellation with his own observations for the year 1689. He considered the ancient scriptures a poetical disguise of true history or the ancient mythology was nothing but historical truth in a poetical dress. However, why he could not appreciate such historical truth contained in the Vedas is not known.

When all other scientists were comparing with Indian astronomic tables why he was interested in locating Zodiac in the Greek mythology? It is again just to cover the real intention as a masquerader

He possessed clearer ideas of all ancient astronomical systems of the world. He studied the chronologies of such civilizations with their astronomical charts, tables and works. Because of his controversies developed with the Church, he had to come to the defense of Moses. According to P. J. Marshall, the more interpid Christians like Sir Issac Newton insisted that no civilization could be earlier than the Jewish one. Thus, slowly, his studies delved on the chronology and histories of the ancient civilizations.

Newton's Personal Library :

J. Harrison¹¹ describes the personal library of Newton and the books he was having : (see next page)

As he had been showing interest in many subjects and discussing with other scientists and colleagues, he must have had many works of the ancients. His theological alchemical and astrological musings point to possession of Indian works as vouchsafed by William Jones. His anti-trinitarian writings are though interpreted differently by making him an Arian, gnostic, deistic, heretic and so on, his leaning towards Vedic interpretation could be seen easily in his writings. He begins with Deus Pater, Deus Finis, Spiritalis Sanctus Deus and of course with Christian adjectives and expressions. However, the full details of the books and manuscripts held by him are not given even today.

Even in September, 2000, Jonathan



Subject	No. of books	Percentage	Total no. of books = 1752 •
Theology	477	27.2	Listed = 857
Alchemy	169	9.6	Balance = 895
Mathematics	126	7.2	Its percentage = 51.1%
Physics	52	3.0	The details of 51.1% and his collection of manuscripts, tables and ancient works of different civilizations obtained through John Flamsteed, Mersenne etc. are not given.
Astronomy	33	1.9	
Total	857	48.9	

Leake¹³ reported that a secret deal between Keele University and Simon Finch, a book dealer had resulted in selling of Sir Isaac Newton's private library and some of his original manuscripts being exported to America. Keele was bequeathed England's leading collection of old mathematics and physics books in 1968 by Charles Turner. The collection included eight books from his library, complete with annotations showing he used them to

help produce Principia Mathematica, his major work. Three first editions of Principia are included in the collection. This only proves that he was having many books and works of other civilization of antiquity including India besides his manuscripts.

As the Indian astronomical tables and / or works were with the following¹⁴, there is no reason to deny that Newton did not have them in his collection :

Scientist/Scholar	His work on India specially
Nicolas Copernicus (1473-1543)	Studied Indian astronomical tables.
Girdano Bruno (1548-1600)	Influenced by the Indian thought.
Tycho Brahe (1546-1601),	His planetary model resembles that of Nilakanta Somasutvan . (1444-1550)
Matteo Ricci (152-1610)	Took astronomical tables from India, Kerala.
Christopher Clavius	
Galilio Galeli (1564-1642)	Studied Indian astronomical tables
Johannes Kepler (1571-1630)	Accused that Indians borrowed from Christians and Jews.
Pope Gregory (1572-1585)	Studied Indian astronomical tables
Robert de Nobili (1577-1656)	Studied & send many Indian astronomical tables to Rome.
M. Simon La Loubere (1642-1729)	Brought Siamese tables and studied Indian astronomical tables
Gortfried Winhelm Leibniz (1616-1716)	Studied Indian astronomical tables. For Calculus, he had fight with Newton.
M. Le Gentil de La Galaisiere (1725-1792)	Studied Indian astronomical tables. Came to India to observe the transit of Venus. Learned astronomy from the Brahmins.



Scientist/Scholar	His work on India specially
Nevil Meskelyn (1732-1811)	Studied Indian astronomical tables & supported Bentley
Joseph Priestly (1733-1804)	'A Comparison of the Institution of Hindoos and that of Moses and Other Ancient Civilizations'.
T. S. Bayer	Furnished information about Hindu asterism
Johm Playfair (1748-1819),	'Some Remarks on the Astronomy of the Brahmins' 'Observations on the Trigonometrical Tables of the Brahmins'.
M. Jean Sylvain Bailly (1774-1814)	Studied Indian astronomical tables
M. Giovanni Cassini	Studied Indian astronomical tables
Jean Baptist Biot (1774-1862)	He supported China to oppose India in the case of authorship of asterism. Studied Surya Siddhanta.
Erard Mollien,	In 1853, presented a paper on the antiquity of the Indian Zodiac.
Almaq Riccoli	Compared the different astronomical tables with that of Indian.
Albert Weber of Berlin (1825-1901)	He proposed that asterism was first conceived by the Chaldeans and then spread to China and India.
John Bentley	The famous opponent of Indian astronomy by all means.
Nicolas Louis De La Callie (1713-1762)	Compared the length of a year of Indians with that of his calculation.
Leonard Euler (1707-1783)	Wrote on 'Hindu Calendar'.
Mayer,	Compared the Indian tables with others and supported Bentley
Father Du Cham	Who brought the astronomical tables to Europe.
M. De La Grange	Studied Indian astronomical tables.
Pierre Simon Marquis De La Place (1749-1829).	Studied and supported Indian astronomical tables.
William D. Whitney	'On the Views of Biot and Weber respecting the Relations of the Hindu and Chinese Systems of Asterisms'.

Therefore, it is amply evident that he had in possession Indian astronomical tables along with the astronomical works, as the tables were appended to the works. His discussion on orbits of Saturn, Jupiter; theory of comets; fluxions and infinitesimals; theory of motion of the moon and planets, chronology of ancient

kingdoms etc., clearly prove the fact.

Plagiarism, Pseudonym writings and Circulating Works of the Ancients as theirs with Modifications : In Middle Ages, thousands of books of different subjects were copied/bound and circulated among the scholars and scientists obtained from Salerno,



Montpelier and Bologna Universities and Cordova, Toledo and other cities. According to Haskins and J. W. Thompson nearly 70,000 to 80,000 books were produced per year catering to the needs of different groups.¹⁵ The Indian, Persian and Arab works were in a great demand. As they had to get details about India through Arabic books, thousands of manuscripts and books were translated into Latin and Portuguese languages. First, they thought that the Arabs were the masters of such books, but, when they knew that actually, they were getting such knowledge from India, they wanted to have direct contacts with India. Thus, the spice trade always accompanied with science trade.

Under the circumstances, the plagiarism had been the order of the day, where not only copyists and forgers, but also scholars of different disciplines usurped, expropriated and appropriated the works of the others and circulated with their names. Some fearing the inquisition of the Church as they were using the 'Pagan / Satan's works', circulated with pseudonym. Yet another group of scholars kept it's so called inventions and discoveries in secret without publication. To quote a western source :

The exposition of techniques using indivisibles in the early to mid-seventeenth century is a good example of simultaneous independent discovery, leading to disputes about plagiarism and priority, exacerbated by mathematicians' reluctance to reveal their methods. Publishing was also difficult, since the first scientific periodicals came into existence only in the latter third of the century'

(<http://www.math.nmsu.edu/~history/book/analysis.ps>).

Jonathan Swift¹⁶ in his famous 'Gulliver's Travels', which is nothing but a figurative story, exposing the manipulations and scientific struggle of European scientists obtaining books and instruments from others, records as follows through his created character. Thus, Gulliver spoke to a Professor

"I told him although it were the custom of the Learned Europe to steal inventions from each other, who had thereby at least this Advantage, tllat it became a controversy as to which was the right Owner,. yet I would take such Caution that he should have the Honour entirely without Rival",

Here, one may notice that -

1. Newton had not revealed or published his works on **'the method of fluxions first occured to his mind in 1665;**
2. He wrote a paper, **Analysu per Equationes Numero Termonium Infinitas**, without mentioning his name and circulated through Isaac Barrow, the Lucastian Professor of Mathematics.
3. Some of his discoveries like **'Hadley's quadrant'** were not published or communicated to the Royal Society, till after Newton's death, when a description of it was found among his papers.
4. His chronology of ancient kingdoms was not published immediately, though he composed it in Cambridge itself. As per the request of Queen Caroline, wife of George II, he sent a manuscript to her **for her private use.**
5. He also prepared another copy for the Abbe / Abate Conti, a Venetian aristo-



erat on the express understanding that it should not be communicated to any other person.

6. In fact, he passed secret documents wherein he expressed his private views on science, philosophy, ancient history and cosmology.
7. He was aware that the well known geometrical methods of the ancients would clothe his new creations in a garb which could appear less strange and uncouth to those not familiar with the new method.
8. Abate Conti charged Newton that he (Newton) had published a letter by Leibniz which he (Conti) had shown to him. It is a fact that Newton had possessed manuscripts removed from Leibniz' library. This proves that scientists were involved in getting manuscripts of the others by any means.
9. Newton himself found 'burning some of his manuscripts possibly some correspondence' as witnessed by John Conduitt and Samuel Crell. Later his niece Catherine 'had certainly destroyed the possibility regarding the chronology of the Greeks'.
10. The missing of his letters written to John Flamsteed about the astronomical tables clearly imply that the tables must have been Indian.

All the above makes it unimaginable to think that the so called great scientists could have stooped down to such a level in committing all such unscrupulous and unbecoming acts. However, that they had actually done so proves that as they could do such things with

their own manuscripts and documents, they could have done anything with other manuscripts and documents. Therefore, the fate of Indian manuscripts and documents possessed by them could have been buried under abysmal darkness.

Newton and Gottfried Wilhelm Leibniz (1646-1716) :

Newton's controversy with Leibniz is well known, but it has to be discussed in the context. Leibniz developed Calculus independently. However, Newton had also been credited with the invention of Calculus. As he first published his paper in 1684 on Differential calculus, it was made public. (Newton had also reportedly discovered similar method as early as 1665, but published only in 1693). This made Newton furious and thereafter, he took every opportunity to attack Leibniz in his writings. Incidentally, this controversy exposes the Indian methodology of Calculus reaching Europe. Some British scholars accused that Leibniz plagiarized Calculus methods from Newton, whereas others accuse that both derived it from the Indian sources, as the subject could not have evolved all of sudden without the rigorous discussion on infinite series and infinitesimals¹⁷. In 1710, Leibniz in a dissertation in *Miscellanea Berolinensia*, tried to construct a comprehensive system of linguistic genealogy, assuming that the languages of Europe and Asia, as well as of Egypt were descended from the same original language¹⁸. Later, William Jones pointed out the weaker argument in his article that and his (Jones's) father was a friend of Newton-Samuel Johnson and Lord Parker, the President of the Royal Society. As Leibniz



was getting manuscripts from China, Newton be receiving from India and that is why latter, Newton must have taken such attempts as lifting of manuscripts from the library of Leibniz.

The Discover of Mathematical Analysis Calculus Series etc :

The sudden discovery of all these topics during 17th century without any epistemological and logical back-ground made many thinkers and scholars to doubt the origins. The western books claim that the methods of mathematical analysis are found in the works of the ancient Greek scholars e.g., Archimedes. The mathematical analysis deals with nature of numbers (rational, real, positive, negative, imaginary), constants and variables, functions, sequences, limits, infinitesimals, infinites etc. All such conceptualizations are not possible without the idea of zero and infinity, origin of numbers and operations of zero with numbers within the limits of 0 and ∞ . Here, it has to be mentioned that Europeans were using Roman numerals till 16th century. There is no trace of zero in the works of Leonardo da Vinci though he has been credited with the invention of so many things !

Robert Burrow¹⁹ showed that Hindus knew binomial theorem before Newton asserting that while Newton was responsible for application of the binomial theorem to fractional indices, the Hindus understood it in whole numbers to the full as well as Briggs, and much better than Pascal. B. N. Seal³⁸ pointed out as to how Newton could have derived his Calculus from Bhaskara (c.1114-1150). He also refuted the argument of

Spottiswoode, Astronomer Royal.

The Attitude of Westerners towards Zero and Infinity :

The westerners themselves have faithfully recorded and accepted that in the late 12th century only, the Europeans actually began to make use of the Zero and decimal system, reportedly introduced to them through Arab traders, bringing them from India. Though they were having about numbers from 1 to 9, they could not understand zero, as it affected considerably all of their thinking process. Their concept of number was only associated and imbedded with counting, calculation and quantification. Moreover, their calendar had never any zero year, though, they claim that their calendar started from B.C.E. They considered zero as an intellectual obstacle.²¹ Without understanding the significance if it, they even opposed the use of it. The resistance took two forms. Some considered them as the creation of devil, while others made fun and ridiculed them.²² As far as infinity is concerned, its usage was in 17th-18th centuries. John Wallis (1616-1703) is claimed to have introduced the infinity symbol. Even after the introduction of calculus in 17th century, the western mind was puzzled with infinity and infinitesimals. The puzzle persisted for nearly two centuries, until Cauchy (1789-1857) and Weierstrass (1815-97) showed how the awkward notion could be eliminated.²³

The West opposed zero and infinity but claimed credit for Calculus ! :

It is intriguing as to why the westerners showed much opposition hatred and horror to the concepts as well as the usage of zero and infinity. The opposition to zero has already



been pointed out. The infinity had been opposed by the west from the Greeks to modern scientists for reasons best known to them. The writers tactfully record that while the Greeks avoided infinity by their 'elegant method of exhaustion', the modern mathematicians brushed it off, saying that it was an illusion. D'Alembert looked upon infinity as nothing but a limit which the finite approaches without ever reaching it.

Thus, all these in-built contradictions, usage of Roman numerals (without 0 and ∞), lack of mathematical epistemology, absence of zero and infinity (essential for the limits), their adaptation and adoption in 17th-18th centuries, and other connected topics clearly point to India.²⁴ Therefore, it is evident that Newton and Leibnitz got Indian works and developed their subject. While the Indian scientist used mention in a descriptive way or in the form of aphorism, they signified in the form of algebraic expressions and equations. Few examples are given as proof:

Arybhata says: 'In a series consisting of terms which are sums of natural numbers, where differences increase by unity, the sum is the continued product divided by six, of the three consecutive numbers of which the first represents the number of terms in the series, or which the same thing, as the cube of that number increased by unity minus the cube root of the cube and divided by six' (Arybhatiyam Ganita II 21).

The natural numbers are 1, 2, 3, 4, 5, 6, 7, 8, ...

Sums of natural numbers, 1, 3, 6, 10, 15, 21, etc. ... $[r(r+1)]/2$

The stanza says that the sum of the n

terms of the second series

$$= [n(n+1)(n+2)]/6 \text{ or}$$

$$= [(n+1)^3 - (n+1)]/6$$

This clearly proves that the usage of series had been there in India even before Arybhata, because he could not have conceived suddenly and transformed into an aphorism immediately.

Brahmagupta (c.628) adopted a second-difference interpolation formula, later known as Newton-Stirling formula, which is derived as follows.

$$D = \frac{1}{2}(d_i + d_{i+1}) \pm \frac{1}{2}(d_i - d_{i+1})\theta/h \quad \dots\dots(1)$$

$$\text{According as } d_i < d_{i+1} \text{ or } d_i > d_{i+1}, \text{ and} \\ f(x+\theta) = f(x) + (d/h)\theta \quad \dots\dots(2)$$

$$\sqrt{(s-a)(s-b)(s-c)(s-d)}$$

Putting $\theta = nh$, and using (1) in (2), we get,

$$f(x+nh) \\ = f(x) + \frac{n}{2}[\Delta f(x-h) + \Delta f(x)] + \frac{n^2}{2}[\Delta f(x) - \Delta f(x-h)] \\ = f(x) + \frac{n}{2}[\Delta f(x-h) + \Delta f(x)] + \frac{n^2}{2}\Delta^2 f(x-h)$$

Madhava of Sangamagrama (1350-1410) expounded series for $\sin x$ and $\cos x$ upto second order. The general series is later known as Brook Taylor (1685-1731) series. He was a pupil of Newton.

$$F(x+h) = f(x) + hf'(x) + (h^2/2!)f''(x) + \dots\dots$$

$$\sin x = x - x^3/3! + x^5/5! - x^7/7! + \dots\dots$$

$$\cos x = 1 - x^2/2! + x^4/4! - x^6/6! + \dots\dots$$

The power series expansion of $\arctan x$ or $\tan^{-1}x$ was reportedly given by James Gregory (1683-75) in 1671 and Leibnitz (1646-1716) in 1673 respectively as follows:

$$\tan^{-1}x = x - x^3/3! + x^5/5! - x^7/7! + \dots\dots$$

Newton used the word 'fluxion', which



means 'flow' or 'flowing' [flux (L), Fluxion (L), Pravah (S)], thus a fluxion is the rate or proportion at which a flowing or varying quantity increases its magnitude. It is derived from 'Pravah' (Sanskrit), which is linear, sinusoidal, or any form varying with time.

In order to find the derivative of a given function, and mainly to solve the inverse problem, Newton replaced the given function by an infinite power series, i.e., the expression :

$a_0 + a_1 x + a_2 x^2 + a_3 x^3 + a_4 x^4 + \dots + a_n x^n$
with the number of terms increasing without bound.

Newton did not know that the theorem on the derivative of a sum might prove invalid for a boundlessly increasing number of terms.

The concept that a variable can be integrated within limits has been there in Upanishads²⁵, which is similar to the modern representation,

$$\int_a^b f(x) dx$$

$$\int_{\text{Kā}}^{\text{Chā}} (\text{Life}) \text{ Brahmin} = \text{Pleasure to unworldly ones}$$

$$\int_{\text{Kā}}^{\text{Chā}} (\text{Life}) \text{ Brahmin} = \text{Akasa to non-physical ones}$$

Thus, the concept, evolution and spread of the knowledge of infinite series etc., to Europe could be as follows :

1. That Al-khowarizmi, in his work, 'Ilm algebr wat muquaballat' mentions the works of Brahmagupta, proves the spread of Indian mathematical knowledge. As his book was translated to Latin by Adelard in 12th century, which is entitled 'Liber algonismi de numero

indorum' remained as a text book in Europe for 400 years, it is evident that it had reached Europe also.

2. Later, in the work of Omar Khayyam in 12th century, algebra and theory of equations are found similar to Bhaskara.
3. The Gauss formula $n(n+1)/2$, for the sum of first n natural numbers, found in 18th century, was known to Indian already as shown above. For appreciation, the following results of Bhaskara-II found during 12th century, at least 600 years before Gauss, are given below :

$$1^2 + 2^2 + 3^2 + \dots + n^2 = n(n+1)(2n+1)/6$$

$$ab = [(a+b)^2 - (a-b)^2]/2$$

The following infinite series for π is known as Gregory's series :

Nilkantha, in his book, entitled 'Tantrasangraha', which was written around 1500 AD mentioned that the following series were known to Madhava, long before Gregory.

$$\pi/4 = 1 - 1/3 + 1/5 - 1/7 + \dots$$

$$\pi/4 = 3/4 + 1/(3^2 - 3) - 1/(5^2 - 5) + \dots$$

$$\pi/4 = 1/(1 + 4.1) - 1/(3^3 + 4.3) + 1/(5^3 + 4.5) - \dots$$

$$\sin \theta = \theta - \theta^3/(1.2.3) + \theta^5/(1.2.3.4.5) - \dots$$

$$\cos \theta = 1 - \theta^2/(1.2) + \theta^4/(1.2.3.4) - \dots$$

4. Madhava also knew infinitesimal, limit concept and the result $\lim_{x \rightarrow \infty} 1/x = 0$.
5. In the year 1835, one English administrative officer published a paper entitled 'On the Hindu Quadrature of the Circle', Royal Asiatic Society of Great Britain and Ireland, 3(1835), 509-523.
6. C. T. Rajgopal published another paper entitled 'A neglected chapter of Hindu Mathematics, Scripta Mathematica 15



(1949) 201-209' expounding the works of Madhava.

7. C. T. Rajgopal and A. Venkararaman published 'The Sine and Cosine series in Hindu Mathematics' in the Journal of Royal Asiatic Society of Bengal in 1949 (3rd series, No. 15, pp. 1-13). K. M. George added an addendum.
8. C. T. Rajgopal and T. V. VEDAMURTHY Iyer published another paper, 'On the Hindu Proof of Gregory Series' in Scripta Mathematica (No. 17, pp. 1-2 & 65-74, 1951).
9. D. T. Whiteside, in his book entitled 'Mathematical Papers of Issac Newton', Vol. II (Cambridge University Press, 1968) in a footnote no. 122 on page 237 mentioned about Madhava's work and noted that newton probably did not know about the Indian discoveries. This is only to negate the Indian knowledge Newton and other scientists possessed.

The value of π given by different scholars are given to understand the basis of conception and evolution of series leading to the invention of Calculus.²⁶

Veda	$\sqrt{10} \approx 3.16$
Babylonian	$25/8 \approx 3.12$
Archimedic	$22/7 \approx 3.1416$
Ptolemy	3.1416
Chungchi	355/113
Aryabhata	$62852/20000 \approx 3.1416$
Bhaskara	$3927/1250 \approx 3.1416$
Madhav	$\pi/4 = 1 - 1/3 + 1/5 - 1/7 + \dots$
Gregory	$\pi/4 = 1 - 1/3 + 1/5 - 1/7 + \dots$
Viete	$2/\pi = \sqrt{2}/2 \pm (\sqrt{2+\sqrt{2}})/2$
Ludholp	3.14159265358979323846

Euler $\pi^2/2 = 1/1^2 + 1/2^2 + 1/3^2 + \dots$

Ramanujan

$$\frac{1}{\pi} = (\sqrt{8}/9801) \sum ((4n)!/(n!)^4) (1.103 + 26390n)/(396)^{4n}$$

$$\pi = 9801/(\sqrt{8} * 1.103) \approx 3.1415926218033$$

$$\frac{2}{\pi} = 1 - 5(1/2)^3 + 9(1.3/2.4)^3 - 13(1.3.5/2.4.6)^3 + \dots$$

Ramanujam has been the recent Indian proof that such series could be produced in an Indian way instead of western one. He wrote many such series without any aphorisms.

Newton and William Jones: Coming to Indian context, Sir William Jones, his son also aided and abetted Newton to reduce the chronology of India. Joseph Priestley specifically relied upon Newton and Jones in reducing the chronology of India.

*'On the chronological question, Priestley again invokes the authority of Newton as well as detailing Jone's determining efforts to reduce the enormous time of Hindu mythical history to proper Mosaic proportions'*²⁷

There is a strong reason to believe that the sheet anchor hypothesis - the Alexander invasion of India - Indian history starting with that - might be a brain child of Newton and that is elaborated by Jones in India, because, this is what Newton says on India:

'If we pass from, hence into India we shall find that country divided into many kingdoms even when Alexander the great invaded it, wch (which) was above two hundred years after Media & Persia were grown into a Monarchy'

And all the British writers with their different capacities repeated the same like a



Sl No	Scientist	His theory I law which was against biblical concepts	How he had been against Indians I Indian chronolo :
1	Sir Isaac Newton	Consubstantiation	The Chronology of the Ancient Kingdoms Amended
2	Joseph Priestlev	His advanced political views affecting the interests of the Church	A Comparison of the Institutions of Moses with those of Hindoos and other Ancient Civilizations.
2	Galelio Galeli	Heliocentric theory. He was compelled to recant his belief in it, a century later, and he was thrown into prison for murrnuring 'E pur si muove' And it still moves).	He was the opinion that Indians obtained astronomy from the Greeks.
3	Johannes Kepler	For supporting Heliocentric theory, the Church hounded him and he migrated to a Protestant country to escape persecution.	He accused that Hindus borrowed from the Jews and C.hristians.

parrot. Perhaps, here the riddle of 'apple' is solved.

Did Scientists use Indian Baiting as a method to escape from the Inquisition or Church Punishment? Incidentally, it can easily be noted that most of the scientists dealt with here are connected with the Church controversies in the sense that their inventions one by one went on demolishing the Biblical beliefs -geocentric theory, Transubstantiation, Consubstantiation, Immaculate conception, Doctrine of Trinity, Resurrection, Ascension and so on. They had been subjected to the inquiries of Inquisition, imprisonment and punishment. Such incidences have been mentioned against each. Therefore, a doubt arises as to whether they had been compelled to oppose Indian chronology as a redemption from the inquisition or otherwise.

These are the scientists, who might have

tilted their views in favot Christianity by opposing Hindus. Of course, there are other scientists, who have suffered inquisition by propounding new scientific theories as well as supporting or reportedly influenced by Hindus, e.g., Bruno John Playfair, Cassini, Bailly, Colebrook. Therefore, historians should be careful in dealing with such biased conditions.

There is ample evidence available to prove the nexus between the scientists and the historians having allegiance to Church. The English and American historians had even engaged in a controversy as to whether or not there had been a direct connection between Protestantism (especially Puritanism) and the scientific (they profess to call it intellectual) revolution²⁹, when much knowledge of science flew from India to Europe. They noted that in the early 16th and 17th centuries, the Catholic camp including Jesuits



facilitated or, at least, did not obstruct progress in certain fields of science when it did not go against Christian interests³⁰. But 18th century changed the picture. As pointed out above, the scientific discoveries started questioning the chronology of the Bible. Thus, Newton was corresponding with Bentley about his discoveries, while fighting with Locke and Leibniz, the priest turned scientist Joseph Priestley rejecting Indian chronology, Kepler accusing Indians that they borrowed their calendar from Jews and Christians and so on.

Conclusion: The history of medieval period Europe upto renaissance and thereafter has much bearing on India in many aspects. India helped Europe, particularly England economically, technologically and scientifically, and also philosophically, metaphysically, logically and theologically. However, evidently, most of the European writers, because of their Eurocentric bias or anti-Indian attitude wanted to suppress the contribution of India to them by all means. There, the depiction of Alexander and Newton poses many questions, as much is hidden secret in the context of historical interpretation. The facts, clearly prove that Newton had gained from India, but evidently because of his Christian bias as well as a British administrator, he looked down India. As he treated Leibniz even after his death, he treated India by deriving maximum knowledge from her. The only difference is that India did not fight with Newton, as he had fought with Hooke, Leibniz and others.

The other possibility is that Newton might have recognized India and Indian con-

tribution -specifically, but the British / European / western scholarship did / do not want such details to be known to Indians, as otherwise their superior position would be questioned. In any case, the more any scientist, philosopher, theologian, believer or scholar reads the Newton's Mss and sources the more truth they know about Newton and India. When much is talked about 'Intellectual property', their rights, 'Patent Rights' and so on, it is hypocrisy to note that the western print and electronic media do not give credit to India in spite of the intellectual benefits derived from her from time to time. It is a shame that they continue to launch and carry-out propaganda in all ways instead of recognizing the truth honestly. Acknowledging the sources, recognizing the base and appreciating its value are the prime duty, responsibility and character of true research methodology.

As John Maynard Keynes has changed the direction of the research on Newton, Indians³¹ should study more about Newton and change the scientific studies, and orient them properly in the right perspective for the benefit of the entire humanity.

Notes and References :

1. John Playfair, *opt.cit*
2. K. V. Ramakrishna Rao *Historicity, Astronomy and Kaliyuga*, to appear in the proceedings of a seminar held at Channai in Oct. 2002 on **Ancient History of India through Vedic Astronomy**.
3. B. L. Van der Warden *The conjunction*



of 3102 B.C., Centarus, 1980 Vol. 24, pp 117-131, Kailash Chandra Verma, *The Kali Era and Ignored Glimpses of Indian Antiquity* ABORI Vol. LVII & LVIII (Diamond Jublie), 1977-78, pp. 1025-1047.

J. F. Fleet, *The Kaliyug Era of 3102 B.C.* JRAS, pp. 479-496; 675-698.

K. V. Ramkrishna Rao, *Kali Era - The Lively Contraversy Among the Western Scholars*, Arybhateeya'99, Thiruvananthapuram, 1999, p. 16.

4. http://43.1911encyclopedia.org/N/NE/NEWTON_SIR_ISSAC.htm

5. D. E. Smith, *History of Mathematics*, Vol. II, Dover Publications, 1958, p. 413.

Counting to Infinity : Wherin, it is mentioned that the symbol $\bar{U}$ has been around for more than two thousand years. The Romans used it to represent 1000, a BIG number to them ! Such claims are made in the western scholarship, but it does not give the philosophical and epistemological background for the development. What works the Roman had is also not mentioned,

www.roma.unisa.edu/07305/symbols.htm

6. Willam Jones, *The philosophy of Asiatic in Asiatic Researches*, Vol. IV p. 169.

'I can venture to affirm, without meaning to pluck a leaf from the never-fading laurels of our immortal Newton, that the whole of his theory, and part of his philosophy, may be found in the Vedas, and even in the works of Sufis.'

7. The connection between Siddhas and Sufis has been brought by the author in the following papers :

K. V. Ramkrishna Rao, *Decoding and Decipherment of Omar Khayyam's Rubaiyat*, Abstract of International Congress in Commemoration of Hakim Omar Khayyam Neyshabouri, Iran 2000, pp. 49-50.

....., *Decoding and Decipherment of Omar Khayyam's Rubaiyat*, Summaries of papers, All Indian Oriental Conference, Madras 2000, pp. 452-53.

....., *Varalatra Nokkil Siddhargalum Sufigalum*, International Islamic Literary Conference, October 2001, Sri Lanka, pp. 360-382.

....., *A Critical Study of Siddhas and Sufis in Historical Perspective*, All India Oriental Conference, Puri, 2002, p. 256.

8. P. J. Marshal, *The British Discovery of Hinduism in the Eighteenth Century*, Cambridge, 1970, p. 26.

Frank E. Manuel, *The Religion of Issac Newton*, 1974, USA.

Sir David Brewster, *Life of Sir Issac Newton in The World's Great Books in Outline*, Edited by J. A. Hammerson, The Educational Book Co. Ltd., London, pp. 1967-1972.

Richard S. Westfall, *Newton, Never Rest*, 1980, USA.

Edward B. Davis, *Newton's Rejection of the Newtonian World View in Science and Christian Belief*, USA.

....., *The Role of Divine Will in Newton's Philosophy*, USA, 1991.



Also the following websites :

<http://www.lib.cam.ac.uk/MSS/Newton.html>

<http://www.newtonproject.ic.ac.uk/>

<http://www.newtonproject.ic.ac.uk/catalogue/newton.htm>

Towards the end of his life, Newton began to denote special attention to theological questions, and in 1773, was published a work entitled **Observations upon the prophecies of Daniel and the Apocalypse of St. John**. Other posthumous works were his **Historical Account of two Notable Corruptions of Scripture**, and his **Lexicon Propheticum**.

9. Issac Newton, **The Chronology of Ancient Kingdoms Amended**, UK, 1728, pp.83-95.

F. Manuel, **Sir Issac Newton, Historian**, Cambridge, 1963, pp. 78-88.

Also see the following websites for more details about Newton's Manuscripts Project, view some of his books/manuscripts on chronology, theology, alchemy etc., :

<http://www.lib.cam.ac.uk/MSS/Newton.html>

<http://www.newtonproject.ic.ac.uk/>

<http://www.newtonproject.ic.ac.uk/catalogue/newton.htm>

10. Jacob Boehme (1575-1624), **The Encyclopedia Britannia**, Vol. III, (9th edition), 1828.
11. J. Harrison, **The Library of Issac Newton**, Cambridge University Press, Cambridge, 1978, cf. pp. 58-78.
12. Thomas C. Pfizenmaier, **Was Newton**

an Arian ?, Journal of the History of Ideas Inc., USA, 1997, pp. 57-80.

13. Sunday Times, London : **Newton's Library Sold to US in Secret Deal**, <http://museumsecurity.org>

Ann Talbot, Issac Newton's Papers up for sale, Sep. 26, 2000. See in :

<http://www.upenn.edu/almanac/v46/n23/honors.html>

14. K. V. Ramakrishna Rao, **The Interest of European Scientists in Indian Calendar and Chronology**, in **Indian Calendar and Chronology** (Seminar papers), Dharibad (Jharkhand), 2003, pp. 1-20.
15. Joseph MacCabe, **History's Greatest Liars**, USA, 1985, p. 3 and 75.
16. Jonathan Swift, **Gulliver's Travels and Other Writings**, Ed. Richardo Quintana, The Modern Library, New York, 1958, p. 148.
- Newton Era**, in **Symposium on Creation**, Vol. VI, pp. 57-90, Pacific Meridian Publishing Co., USA, 1977.
- Also see in www.phy.un.nl/~vgent/astrology/newton.htm
17. Aryabhata Group of University of Exeter, **Transmission of the Calculus from Kerala to Europe**, 2000, p. 5.
18. Holger Pederson, **The Discovery of Language**, Indiana University Press, Bloomington, 1962, p. 9.
19. Reuben Burrow, **A Proof that the Hindus had the Binomial Theorem**, Asiatic Researches, Vol. II, p. 494.
20. Brajendranath Seal, **The Positive Sciences of the Ancient Hindus**, Motilal, New Delhi, 1985, p. 77-79.



21. Karl Menninger, **Number Words and Number Symbols - A Cultural History of Numbers**, The MIT Press, England, 1969, pp. 422-424, 428, 438-439.
22. Karl Menninger, opt.cit, p. 422.
An educated Frenchman wrote as late as in the 15th century, 'Just as the rag doll wanted to be an eagle, the donkey a lion, and the monkey a queen, the cifra put on airs and pretended to be a digit.'
23. The Oxford Companion to Philosophy, 1995, USA, p. 5.
International Encyclopedia of Communications, opt.cit, p. 213.
John Allen Paulos, the sectional compiler notes that the socalled abacus of any civilization had no zero to count numbers in terms of ten, hampering the discoveries !
24. K. V. Ramkrishna Rao, **The Concept and Evolution of Zero**, in the Abstract volume of National Seminar on History of Indian Sciences, Cochin, 1998, pp. 10-11.
....., **The Concept and Evolution of Infinity**, in 'Book of Extended Abstracts' of the 3rd Congress on the Traditional Science and Technology of India, Varanasi, October, 1998, pp. 73-74.
....., **From Zero to Infinity**, Abstract of National Conference on Science and Sanskrit, Gwalior, 1999, p. 13.
25. K. V. Ramakrishna Rao, **From Zero to Infinity**, Vigyana Bharati Pradeepika, Vol. 8, No. 1, April, 2002, pp.
....., **Sunya se Anant Tak** (in Hindi), Vigyana Bharati Pradeepika, Vol. 8, No. 2, October 2002, pp. 10-15.
26. Sudarsan Nanda, **Mathematical Development in Ancient India and Europe**.
27. Martin Priestman, **Romantic Atheism - Poetry and free thought, 1780-1830**, Cambridge University Press, 1999, pp. 25-26.
Can be viewed through website pages upto 26 from the wrapper - http://assets.cambridge.org/0521621240/sample/052162140_WSCOO.PDF.
Moreover, the western scholars have also used such writings, which expose the antiquity of Indians by all means under new subjects. In the context, Martin Priestman, while discussing 'Romantic Atheism', records as follows :
'The brief Remarks of Dupuis were published as a pendant to Priestley's more ambitious A Comparison of the Institutions of Moses with those of the Hindoos and other ancient nations (1799). Deawing largely on Sir William Jones's Asiatic Studies (particularly, Institutes of Hindu Law, or the Ordinances of Manu and Dissertations and Miscellaneous Pieces relating to the History and Antiquities, the Arts, Sciences and Literature of Asia), Priestley demonstrates impressive if nearly acquired mastery of the rapodly expanding field of Orientalist knowledge which, if not carefully patrolled, might lead to all kinds of marginilization of Christianity by comparison to other culturs and belief sustems. This danger

(Continued on page 29)



(From Page 24...)

is represented by another Frenchman, Langles, who sees 'the religion of the Hindoos' as the source for 'those of the Egyptians and Jews, who have done nothing but ape the latter, of the Chinese, of the Greeks, of the Romans, and even of the five books of Hindu Vedas are the prototype of the five books of Moses, who.... only copied Egyptians works, originally from India.' Furthermore, Langles accepts a non-Mosaic chronology where by 'many thousands of years before' the Egyptians, or Jews 'formed themselves in societies, or ever thought of forming a religion, the civilized Indians adored the supreme being, eternal, almighty and all-wise, divided into three persons.' (Works, XVII, pp. 139-42, 324).

'On the chronological question, Priestley again invokes the authority of Newton as well as detailing Jone's determined efforts to reduce the enormous time of

Hindu mythical history to proper Mosaic proportions.'

Thus, it is evident that he had collaborated with William Jones and the latter had definitely reduced the Chronology of India.

28. Newton, From Keynes Ms. 146/S: 295/R20, under Chap. 1 The Original of Monarchies.
 29. Frederick L. Nussabaum, **The Triumph of Science and Reason**, Harper and Row, New York, 1953, pp. 179-80.
 30. Charles Webster, **The Intellectual Revolution of the Seventeenth Century**, Routledge and Kegan Paul, London, 1974, pp. 264, 270 and 277.
 31. (HM) **Unpublished Manuscripts of Newton**. See the website of 'Historio Mathematica' for the full correspondence.
- C. K. Raju has started a debate with Tom Whiteside on the Newton's Manuscripts.

